

**REBUILD ATLANTA  
ENERGY AUDITOR'S REPORT  
SOLID WASTE SERVICES: LIDDELL SUBSTATION**

Prepared: June 23, 2004

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## **REPORT PREFACE**

The information contained in this report consists of findings and recommendations conducted by the City of Atlanta's Energy Conservation Program through the Rebuild Atlanta initiative. The following information was gathered during a walk-through type audit designed to assess the general condition of the facility with an emphasis on discovering energy efficiency opportunities. All related observations and recommendations are based on the best available knowledge of the auditors and should not be considered conclusive, but rather an indication of building conditions. Any actions taken should be done so with the independent advice of experts. The Energy Conservation Program will be pleased to assist the Department of Public Works in coordinating this technical assistance.

## Building Summary



### **Liddell Substation 1540 Northside Drive Atlanta, Georgia 30318**

Year Built:	Unknown
Building Size:	~71,000 square feet (two stories)
Occupants:	~75 FTE
Operating Schedule:	7:30 a.m. – 4:00 p.m.
Electricity Cost (2003):	\$42,649
Electricity Usage (2003):	586,560 kWh
Cost Per Square Foot:	\$0.60/ft <sup>2</sup>
Usage Per Square Foot:	8.26 kWh/ft <sup>2</sup>
Natural Gas Cost (2002):	\$36,144
Natural Gas Usage (2002):	57,371 CCF
Cost Per Square Foot:	\$0.50/ft <sup>2</sup>
Usage Per Square Foot:	0.80 CCF/ft <sup>2</sup>

## Recommendations

This section focuses on items that will be pursued by the Energy Conservation Program in cooperation with your department. Follow-up actions are outlined in more detail in Appendix A.

- Lighting
  - Retrofit all fixtures with T12 lamps and magnetic ballasts to T8 and electronic ballasts
  - Retrofit all incandescent downlamps with compact fluorescent lamps
  - Replace incandescent exit signs with LED/ENERGY STAR fixtures
  - Consider improving lighting quality in shop areas/work bays with high output fluorescent lighting
  - Consider occupancy sensors for bathrooms, classrooms and other infrequently occupied areas
- Heating, Ventilation and Cooling
  - Retrofit shop and storage bays with infrared heating units and discontinue use of boiler for space heating
  - Install HVAC controls to reduce energy waste during unoccupied periods
- Envelope
  - Seal major ceiling penetrations to improve comfort and reduce energy expenses



### Reported Items

This section contains items that were noted during the energy audits but do not fall under the scope of the Energy Conservation Program. Additional detail on these items is provided in Appendix B.

- Envelope
  - Water leaks through roof/ceiling common in administrative and shop areas
  - Building envelope, particularly roof/ceiling, is in poor condition



## Narrative

The Liddell Substation (Liddell) in Atlanta, GA, houses operations related to solid waste and groundskeeping activities. The facility is owned and run by the City of Atlanta Public Works Department. Equipment maintenance and storage are major functions at the facility. The overall condition of the facilities at Liddell can be described as marginal.

In the main building front part, water leaks in around the perimeter of the building are typical and occur in many areas. Several gaping holes in the ceiling expose the roof above. Heating and cooling systems may or may not work, and the means of controlling some of these systems are known only minimally — by trial and error — by building occupants.

The front part of the main building (Building 'A') is office and meeting areas, accounting for about 20% of the floor area in this building. The back part is older, houses shops and warehouse space, and accounts for 80% of the floor area in this building. In the back area, vents open through the roof make water intrusion easy, so water leaking into the back part of the building is probably taken as a normal occurrence. Building A in total accounts for about 75% of the floor area at Liddell.

Building B houses smaller parts and shop areas. This building appears to have much lower use. Vegetation growing on the building, deteriorating paint, and a rusted door indicate the facility conditions here. This building accounts for 16% of the floor area at the substation.

Building C is the maintenance shop for the solid waste trucks. Building C accounts for a little less than 10% of the floor area at the facility.

Overall, Buildings B and C have simple heating systems that will present major energy problems only if doors are left open for a long time. Workers are not as likely to do this if they wish to stay warm, but unoccupied periods may be a problem.

Building A presents most of the challenges for energy at this facility, due to the more extensive office areas mixed with shop and warehouse, as well as the age of the back part of the building. The older, back part of Building A accounts for about 60% of total floor area at the substation.

The old, back part of Building A is partly heated with infrared (IR) heaters and partly heated (apparently) with steam heating and ventilating units. All steam units should be abandoned, and all heating converted to some type of localized, IR heating.

Once the holes in the roof are sealed properly, some type of heat-recovery ventilation (HRV) systems should be installed to assure engine exhaust and other contaminant removal is assisted.

Operating hours in Buildings A and B are about 2,500 hr/yr, and in Building C about 5,000 hr/yr.

## *Lighting*



Many areas in the building have T12 fluorescent lighting, and some have incandescent, which all should be changed at least to T8 fluorescent and a lower wattage. Floor area affected is about 35,000 square feet, about half of the total floor area. Current low levels of working lights means working, installed wattage is about 0.7 W/sf average, although this varies a lot, for a total of about 25 kW.

If current lighting levels are maintained, meaning few if any nonfunctioning fixtures are made to work again, total wattage should be able to be reduced about 40% in an effective retrofit to T8 lighting and electronic ballasts. Savings are estimated to be about 10 kW for 2,500 hr/yr, 25,000 kWh/yr, worth about \$2,000/yr. Heating energy increased cost is assumed to be negligible given current building conditions that also must be improved.

Installed cost is estimated at an average of \$0.50 per square foot to replace fixtures, for a total cost of about \$17,500. Simple payback for these values is 8.75 years.

Quality of lighting is potentially an important issue, as the new lighting would, in most areas, be an improvement over current lighting. However, putting a dollar value on improved lighting is difficult. Improvement in lighting would potentially affect decisions to make nonfunctioning fixtures work again.

HID lighting such as metal halide has fallen significantly behind in the technology and energy-efficiency race to fluorescent fixtures for high bay applications like warehouses and shops. Newer advanced fluorescent lighting fixtures for such high-bay applications typically provide more light, much higher-quality light, and energy savings, when compared to HID lighting. Fixtures can also have occupancy sensors, which would turn off lights in areas where workers are not present. Heating energy increased cost is assumed to be negligible given current building conditions that also must be improved.

For ~50 HID fixtures, current energy use is estimated at 60,000 kWh/yr, worth about \$4,800/yr. Savings would be about 30%, which is 18,000 kWh/yr, worth \$1,400/yr. Installation cost for replacing existing HID fixtures with high-bay fluorescent fixtures is estimated at \$300/fixture and 50 fixtures, for a total of \$15,000. The simple payback for this retrofit is about 11 years. A decision to proceed with this retrofit may have to be based on other considerations than energy alone. However, bundling all the measures together may make a reasonably attractive, overall package.

### *HVAC and Envelope*

The steam boiler in Building A appears to serve only a few heating and ventilating units in the shop areas. The design of the boiler appears to be of low efficiency, and use of steam for building heating is inefficient, as steam must be generated at about 230 F or so. Also, operation of a steam system has several other inefficiencies. Apparently because of the existing holes in the roof, infrared (IR) heaters have been installed in some areas.



Overall, the holes in the shop areas roof of building A should be sealed off, at a cost of about \$5,000. Savings are estimated to be about \$500/yr. The simple payback is about 10 years, but this sealing has to occur to make IR heating work more effectively.

Abandoning the steam boiler has essentially no cost. Installing IR heaters throughout the shop and warehouse areas of Building A that currently do not have IR heaters is estimated to cost \$20,000. Two 2000-CFM HRV systems, one for each of the two large shop areas, are estimated at \$10,000. Total cost for sealing holes, abandoning the steam boiler, and installing additional IR heating and HRV systems is thus estimated at about \$35,000. Annual cost savings is estimated at \$10,000/yr, for a simple payback of 3.5 years. Gas savings is about 16,000 therms/yr.

The substation currently has limited ability to control heating and cooling systems, and the ability to change temperature setpoints automatically during unoccupied periods would be a major upgrade. Heating and cooling systems appear to run continuously at present.

Cooling setback is of questionable merit, since cooling energy is regulated now to a major degree simply by having systems that often do not work. As a result, cooling savings are estimated to be small. If heating setpoint adjustment control is installed as described below, adding the ability to control cooling is a small additional cost. Possible cooling savings are estimated to be in the range of 10,000 kWh/yr, worth \$600–700/yr.

Heating setback and control of door and window closure appears to be a more important issue. The ability to reduce heating setpoints during unoccupied periods to 55 F or so appears to be important to energy savings at this site, although keeping such a system functioning may be beyond the level of maintenance that can be provided here.

Assuming holes in the roof of Building A are sealed, if an automatic control system were installed to change heating setpoints to 55F during unoccupied periods, an additional savings in gas use of about 8,000 therms/yr is estimated, worth about \$5,000/yr. Total installed cost for adding this control system and interfacing with existing controls in some fashion is estimated as 20 control points at an overall installed cost of \$1,250 per point: \$25,000. The simple payback is 5 years.

#### *Utility Consumption and Cost*

Electricity use for Liddell is fairly normal for this type of operation and reasonable. Gas data are only available for 2002. Gas use is much too high and should be reduced 40%. The blended energy rates for Liddell, based on 2002 for gas and 2003 for electricity are:

Electrical	\$0.0727 / kWh
Natural Gas	\$6.30 / DTh

Natural gas use during heating season spikes very high relative to the summer, which is typical for buildings with major holes in them. An old steam boiler serves a few heating units in the main building, and this boiler is severely oversized for the heating it provides, not to mention the



inappropriate use of steam. In addition, holes in the roof and poor glazing make heating the facility a difficult proposition at best.

The large vent header and smaller steam header on the steam boiler for Liddell guarantee inefficiency for simple building heating, but at this facility the inefficiency is compounded by only having a few terminal units still on steam. This boiler should be abandoned and never used.

There are several holes in the roof in the main building that are directly open to the outside that must be sealed for any reasonable attempt to heat this facility. Clerestory fan openings allow outdoor air to pour in during the winter. There are several fan openings (4–8) in clerestories in the main building. In addition, several large vents (~3 sq ft each) are directly open to the outside through the roof. All these vents and holes must be sealed if heating is to be handled reasonably.

### Goals

The goals for this building are focused on two areas, lighting and HVAC.

This building is a candidate for a lighting retrofit in accordance with the City of Atlanta Lighting Guidelines. Some lighting technologies installed will have greater life and will reduce maintenance resources required for upkeep. A lighting retrofit should be carefully considered given the deteriorating condition of this facility, as water leaks and other deficiencies could complicate the retrofit process, but the benefits of improved lighting quality, particularly in the shop areas, should be explored.

The second major goal for the facility is to establish a more effective heating system for the main building on this site. Energy use and costs are unnecessarily high due to poor building envelope conditions and an inefficient heating system. Sealing the building envelope and converting to 100% localized, infrared heating can increase comfort for employees and reduce natural gas consumption and expenses.

### Conclusion

The primary focus of this Energy Measures Scoping Assessment was aimed at identifying natural gas and electricity cost-savings measures.

This report estimates both energy and cost savings resulting from implementation of these measures. These estimates of savings are only intended to bracket, in terms of energy and dollars, the potential offered by each particular recommendation. The intended purpose in providing this information is to aid with the identification of opportunities for decreasing energy use, along with a relative means for prioritizing the list of recommendations.

Additional efforts are required to properly scope and prepare to implement the measures reported here. The simple payback on the overall implementation of all these measures together is about 5 years, with a total investment of a little over \$90,000. However, further study and refinement of the measures proposed is required before proceeding with any project to implement the measures.



## **Appendix A: Recommended Actions (Follow-up Actions Planned)**

### Lighting

Schedule lighting retrofit for all T12 fixtures and LED Exit Signs as recommended by the *City of Atlanta Lighting Retrofit Guidelines*.

Explore high bay lighting retrofit options to improve lighting quality and reduce energy use and cost.

### HVAC

Install infrared heating units throughout building and discontinue use of steam boiler for space heating.

Install appropriate controls to reduce energy waste during unoccupied periods



## **Appendix B: Reported Items (No Follow-up Action Planned)**

### Envelope

There were envelope penetrations found throughout the building creating water leaks and excessive heating bills. Several penetrations may be sealed relatively inexpensively to improve comfort levels and heating efficiency. Any improvements should be made with the long term prospects of the building in mind.



## **Appendix C: Additional Resources**

### Lighting

Please see separate attachments, *City of Atlanta Lighting Retrofit Guidelines*, for information on how to conduct a building lighting upgrade.

### HVAC

Please see the separate attachment, *Proposed Project Brief: Infrared Heating* for more information on potential HVAC upgrades

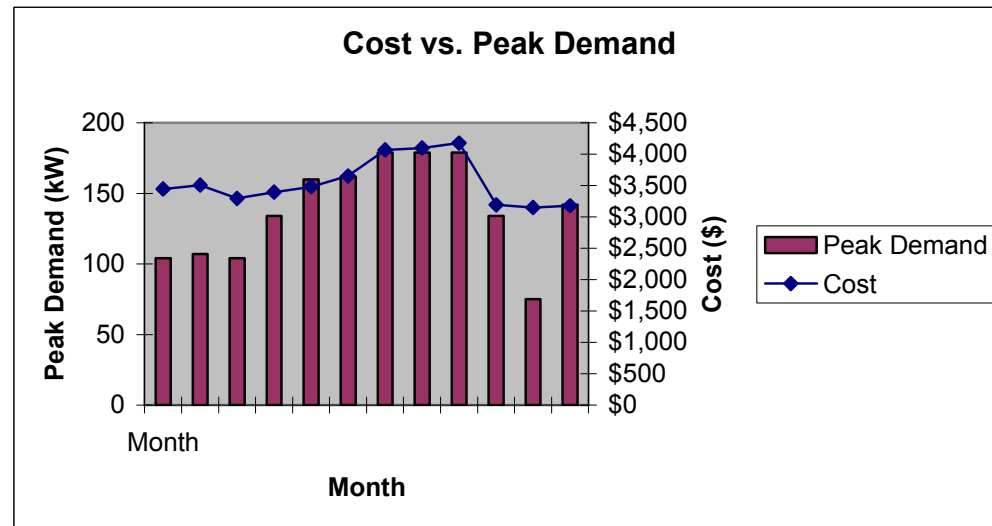
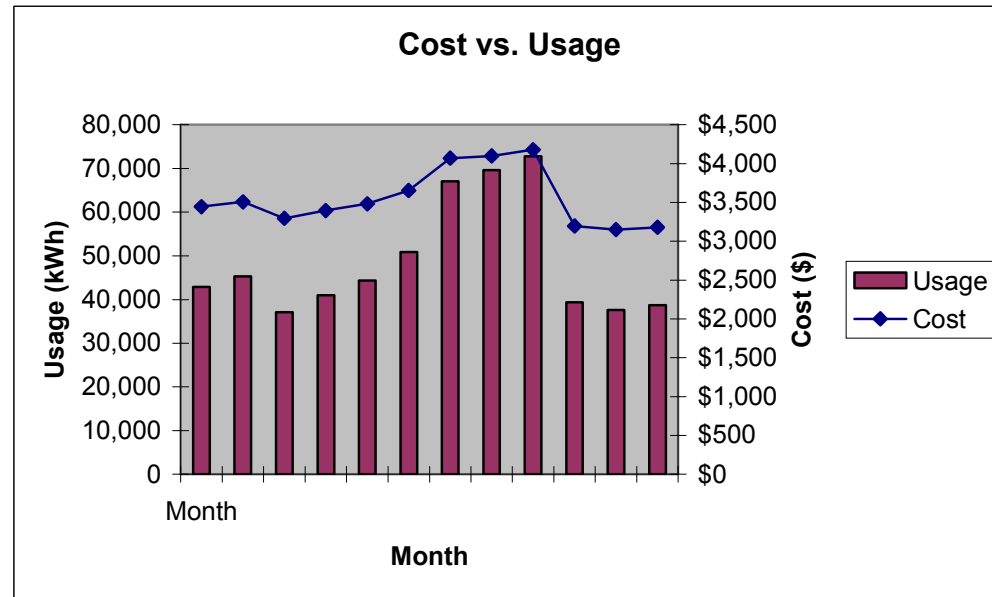


## **Appendix D: 12 Month Utility Data**

The Table on the following page shows the electricity use, cost and peak demand for the year 2003. The top graph, labeled “Cost vs. Usage” shows the relationship between electricity consumption and cost for the year 2003. The bottom graph, labeled “Cost vs. Demand” shows the relationship between cost and peak demand for the year 2003.

Additionally, since major recommendations in this facility offer the potential to reduce natural gas usage, natural gas consumption and cost are provided as well.

Month	kWh	Peak kW	Cost
Jan-03	42,880	104	\$3,445
Feb-03	45,280	107	\$3,507
Mar-03	37,120	104	\$3,296
Apr-03	40,960	134	\$3,396
May-03	44,320	160	\$3,482
Jun-03	50,880	162	\$3,652
Jul-03	67,040	179	\$4,069
Aug-03	69,600	179	\$4,099
Sep-03	72,800	179	\$4,179
Oct-03	39,360	134	\$3,195
Nov-03	37,600	75	\$3,150
Dec-03	38,720	142	\$3,179
<b>Total</b>	<b>586,560</b>	<b>N/A</b>	<b>\$42,649</b>



Month	CCF	Cost
Jan-02	13,115	\$8,262
Feb-02	10,868	\$6,847
Mar-02	5,945	\$3,745
Apr-02	2,377	\$1,498
May-02	932	\$587
Jun-02	59	\$37
Jul-02	94	\$59
Aug-02	168	\$106
Sep-02	466	\$294
Oct-02	3,043	\$1,917
Nov-02	8,317	\$5,240
Dec-02	11,987	\$7,552
<b>Total</b>	<b>57,371</b>	<b>\$36,144</b>

